

REMARKS

Claims 1-21 and 23-29 are pending in the application and stand under final rejection as obvious under 35 U.S.C. §103(a). The limitation of claim 22 has been incorporated into claim 1 and has been cancelled.

The Amendment of Claims 1, 2, 3, 4, 23, and 26

Claim 1 has been amended by specifying that the Fischer-Tropsch derived feed must contain at least five carbon atoms. Support for this amendment may be found in various places in the specification, most specifically at page 5, lines 9-19, where the terms "Fischer-Tropsch condensate" and "Fischer-Tropsch wax" are defined and also in the description for Figure 1 where the feed to the hydrotreating unit 8 is discussed on page 6, lines 23-27. Additional support may also be found in original claims 23 and 26 which specifically state that the feed to the hydrotreating unit is a Fischer-Tropsch wax and a Fischer-Tropsch derived condensate, respectively. Applicants also have included the limitation of original claim 22 into claim 1 which now specifies that the Fischer-Tropsch product recovered from the oligomerization zone comprises diesel.

Claims 1, 23, and 26 have been amended to include the additional limitation that the hydrotreating zone be operated under conditions which limit the cracking conversion to 20% or less. This amendment simply incorporates the definition of hydrotreating which appears in the specification on page 14, lines 25-27. Therefore, this amendment does not constitute new matter but merely incorporates limitations which were inherently present in the term as originally present in the claims.

The amendments to claims 2, 3, and 4 are made in order to make the language in each dependent claim consistent with the language used in amended independent claim 1.

Entry of these amendments is proper after final rejection because none would require an additional search and would not place an additional burden on the Patent Office. Applicants point out that each amendment merely clarifies certain limitations which were inherently present in the original claims as filed or as in the case of the amendment of claim 1 merely incorporates limitations which were specifically present in original claims 22, 23, and 26.

Why the Rejection of Claims 1-17
under 35 U.S.C. §103(a) Cannot Be Sustained

Independent claim 1 has been amended in order to clarify the invention and address specific concerns mentioned in the recent Office Action. With these amendments, Applicants submit that claims 1-17 may be clearly distinguished over the prior art.

Claims 1-17 stand under final rejection as obvious over U.S. Patent No. 5,371,308 (hereafter referred to as Grosselink et al.) in view of U.S. Patent No. 6,395,948 (hereafter referred to as Hope et al.). Applicants will not repeat in detail the arguments presented in the previous response for patentability over the two cited references. However, Applicants' prior remarks remain relevant and will be summarized to the extent they address the specific issues raised in the recent Office Action. The Patent Office is directed to Applicants' prior response for a more detailed elucidation of the arguments summarized below.

The Office Action argues that the process described in Grosselink et al. teaches a process similar to the process claimed by Applicants, except the reference fails to

teach the use of an ionic liquid oligomerization catalyst. However, Applicants pointed out in their first response the following:

- The process described in Grosselink et al. is intended to produce lower olefins which are defined as olefins containing from 2 to 4 carbon atoms. At no point in the process claimed by Applicants are lower olefins the intended product or even an intermediate product. Applicants' process is intended to yield higher molecular weight products such as diesel and base oils which are characterized by at least 9 or more carbon atoms in the molecule. Diesel is considered to contain between 9 and 19 carbon atoms in the molecule. Lubricant base oils contain a minimum of 20 carbon atoms in the molecule. The products recovered by the process of Grosselink et al. contain no more than 4 carbon atoms. With the amendment of claim 1, Applicants have clarified this point of difference.
- While the hydroprocessing operation of Grosselink et al. would remove some of the oxygenates present, the primary purposes for this operation in the reference are to reduce the boiling range of the products and to isomerize the feed prior to the thermal cracking step. Cracking of the molecules in Applicants' invention is undesirable and is intentionally minimized. Applicants specifically defined hydrotreating in the specification as an operation in which the cracking conversion is 20% or less. Higher conversion rates would unreasonably reduce the final product yield. This limitation has been added to claim 1 in order to further emphasize this point.
- Grosselink et al. does not suggest the use of an oligomerization step using an ionic liquid catalyst as in Applicants' process. The oligomerization step using an ionic liquid catalyst is the heart of Applicants' invention. The hydrotreating

step is essential in Applicants' process in order to remove substantially all of the oxygenates present in the feed in order to prevent them from interfering with the ionic liquid oligomerization catalyst. This has no counterpart in Grosselink et al. because this reference does not use an ionic liquid oligomerization catalyst and, consequently, fails to recognize the importance of lowering the amount of oxygenates present to the level necessary to prevent deactivation of the ionic liquid catalyst.

The recent Office Action argues that Grosselink et al. suggests that an olefinic feedstock can be used in an oligomerization process. However, the olefins which the process of Grosselink et al. feeds to the oligomerization process must of necessity be C₄ hydrocarbons, since the products of the process are C₂ to C₄ hydrocarbons which are normally gases at ambient temperature. As pointed out in Applicants first response, C₂ to C₄ hydrocarbons are undesirable side products in Applicants' process. The desired products of Applicants' claimed process are diesel and lubricating base oils which are generally defined as containing a minimum of 9 carbon atoms. Diesel is generally considered to contain from 9 to 19 carbon atoms and is a liquid at ambient temperature. Lubricating base oils are considered to contain 20+ carbon atoms. Consequently, not only is the olefin feed to the oligomerization step different between the process described in Grosselink et al. from that used by Applicants, but the products are also different. With the amendment of claim 1, Applicants have clarified this point.

The Office Action states that the arguments presented in Applicants' prior response on the point just discussed were not persuasive because the claims in the case do not specifically name diesel and lubricating base oils as products of the modified process. With the amendment of claim 1 this should no longer be an issue for claims 1-21. However, Applicants also wish it to be noted that this statement by the Patent Office

is factually incorrect with regard to original (and amended) claims 23 and 29.

Independent claim 23 specifically identifies the product of the claimed process as lubricant base oil. Independent claim 26 specifically identifies the product of the claimed process as diesel.

The Office Action notes that Grosselink et al. does not disclose that the "hydrotreated" stream would contain less than 100 or 200 ppmw of elemental oxygen, but the Office Action argues that since the conditions in the hydrotreater are similar the result would be the same. It is instructive to note that Grosselink et al. never refers to this hydroprocessing step in his process as a hydrotreating operation. The closest the reference comes is when he identifies the process as a "hydrogenation" operation which implies that the primary purpose is to saturate the double bonds present in the molecules.

As already noted, the primary purpose of the hydroprocessing step in Grosselink et al. is to crack the molecules into olefins suitable for the production of C₂ to C₄ olefins, not to reduce the oxygen content of the feed although some removal of oxygenates would be expected to occur. Hydrogenation is not even the preferred hydroprocessing operation in the Grosselink et al. process. Hydrocracking is preferred because the olefin feed to the oligomerization step in Grosselink et al. must be C₄ olefins. It is simply impossible to produce lower olefins by oligomerizing a C₅₊ olefin feed. Therefore, the hydroprocessing step of Grosselink et al. is arguably for an entirely different purpose than the hydrotreating step of Applicants invention. Grosselink et al. is not concerned with the oxygenates to the same extent as with Applicants' invention, because the downstream processing steps used by Grosselink et al. are not affected by the presence of oxygenates. It is Applicants' discovery that oxygenates will present a problem when an ionic liquid catalyst is employed in the oligomerization step.

The Office Action suggests that since some of the conditions in the hydroprocessing step taught in Grosselink et al. overlap the hydrotreating conditions employed by Applicants, the two process steps must be the same. The Office Action goes on to assert that Grosselink et al. at column 3, lines 16-19, teaches that the hydrogenation operation is operated without substantial cracking. This statement is taken out of context and fails to consider the entire teaching of the reference. The hydrogenation step referred to is only one of several steps which are lumped together in the reference under the generic term "hydroprocessing". The primary purpose of the hydroprocessing operation in Grosselink et al. is to crack the molecules of the feed. For this reason it is not likely that the hydroprocessed intermediates taught in Grosselink et al. and the hydrotreated intermediates in Applicants' process are the same or even similar. The hydroprocessing operation referred to in the reference is intended to crack the molecules in the feed to produce lower molecular weight olefins. Applicants' process minimizes cracking and produces a substantially oxygenate-free C₅₊ intermediate. It is not logical to argue, as the Office Action does, that two process steps which produce different products are essentially the same.

As already suggested, the preferred method for carrying out the hydroprocessing operation in Grosselink et al. involves a series of hydroprocessing steps. The reference says that the hydroprocessed synthetic oil fraction is preferably "prepared by hydrogenation, followed by hydroconversion and/or hydrocracking." See column 6, lines 34-36. The point being that the hydroprocessing operation taught in the reference is not the same as the hydrotreating step used in Applicants' process. By focusing on only a single aspect of the hydroprocessing operation described in Grosselink et al., the Office Action fails to consider the entire teaching of the reference.

In order to overcome the shortcomings of Grosselink et al., the Office Action has combined the primary reference with the teachings of Hope et al. which describe the

use of ionic liquid catalysts for the oligomerization of alpha olefins. The recent Office Action states that "it would be expected that the olefinic product of Grosselink et al. would be successfully polymerized in the process of Hope et al." However, the Office Action provides no scientific basis in support of this conclusion. Applicants argue that it would not be obvious for one skilled in art to use the ionic liquid oligomerization process of Hope et al. to oligomerize the olefinic feeds used in both the process of Grosselink et al. and of Applicants.

Hope et al. is concerned with the polymerization of alpha olefins which are pure compounds, i.e. not mixtures of hydrocarbons of varying molecular weights; containing no more than 14 carbon atoms; and having a single double bond between the first and second carbon atom. Grosselink et al. and Applicants invention are concerned with hydrocarbon mixtures which contain molecules having anywhere from 2 to over 1000 carbon atoms in the carbon chain, which include hydrocarbons characterized by linear, branched and cyclic structures. Some of the hydrocarbons in Fischer-Tropsch mixtures are olefins but a significant percentage are also paraffins, i.e., saturated. In addition, of those olefins present, only some will be alpha olefins. Some of the olefins also will be internal olefins, and some will likely have multiple unsaturated carbon to carbon bonds. In addition, Fischer-Tropsch materials contain impurities in the molecules which may interfere with downstream processing, such as sulfur, nitrogen, and oxygen. To suggest that the same process used for the oligomerization of alpha olefins as taught in Hope et al. can be used for the oligomerization of Fischer-Tropsch derived hydrocarbons is pure speculation in the absence of actual experimentation. At best it is an invitation to try which is an improper standard to apply under 35 U.S.C. §103(a). See *In re Fay v. Fox* 146 USPQ 47 (CCPA, 1965) and *In re Romer* 59 USPQ 2nd 1527 (CAFC, 2001).

Hope et al. is not concerned with the problem posed by the presence of oxygenates in the feed to the oligomerization step, because there are no oxygenates present in the feeds of Hope et al. Thus neither the primary reference (Grosselink et al.) nor the secondary reference (Hope et al.) recognizes the problem solved by Applicants because neither had to deal with it.

The Office Action criticizes Applicants' earlier response by stating that the assertion that "Hope et al. does not deal with the contaminants of oxygenates is not persuasive because the step of removing oxygenates is taught in Grosselink et al." However, Applicants ask where is the thread that ties the teachings of these two references together aside from Applicants' disclosure? Grosslink et al. and Hope et al. are dealing with different hydrocarbon feedstocks, using different catalysts in a different oligomerization process, producing different products, and addressing different problems. There is no logical or scientific basis for combining these references in the manner the Office has done. It is well established that there must be some logical reason apparent from positive, concrete evidence of record that justifies the combination of primary and secondary references. See *In re Regel* 188 USPQ 136 (CCPA, 1975). The Office Action has randomly picked teachings found in various prior art references which have little or no relationship with one another except for Applicants' disclosure. The mere fact that two isolated references drawn from unrelated art may be combined in such a way to arrive at Applicants invention is not the proper standard for determining obviousness.

In summary, there is no basis for combining Grosselink et al. and Hope et al. in the manner in which the Patent Office has done in both the first and second Office Actions. The feeds described in the two references are different from each other, the processing steps are different from each other, and the final products are different from each other. Therefore, Applicants argue that the combination of

Grosselink et al. and Hope et al. is not a proper combination. In addition, it is pointed out that neither reference suggests the problem solved as part of Applicants' invention. Under the circumstances there would be no incentive for one skilled in the art to substitute the oligomerization process described in Hope et al. for the oligomerization step described in Grosselink et al. It is respectfully submitted that claims 1-17 as they currently appear in the case are patentable over the cited references.

The remaining claims in the case were rejected over various combinations of the references already cited as well as additional secondary references. Applicants will summarize the previous arguments presented for patentability over these combinations of references which remain relevant here and will add some additional explanation where it appears warranted.

The Rejection of Claims 18-21

Claims 18-21 (claim 22 is cancelled and no longer relevant to the discussion) are under final rejection as obvious over Grosselink et al. in view of Hope et al. further in view of U.S. Patent No. 5,000,840 (hereafter referred to as Anthes et al.). Anthes et al. teaches the catalytic dewaxing of an oligomerization product to produce base oil in order to improve the cold flow properties of the product. Anthes et al. fails to overcome the deficiencies of either Grosselink et al. or Hope et al. This reference describes a group of catalysts useful for dewaxing hydrocarbons. It teaches nothing about Fischer-Tropsch derived hydrocarbons (either feeds or products), the presence or absence of oxygenates, hydrotreating to remove oxygenates, or oligomerization of olefins (conventional or with an ionic liquid catalyst) to yield diesel or base oil. Consequently, Anthes et al. is of only marginal relevance to the claims in this Application.

The Rejection of Claims 23-29

Claims 23-29 are under final rejection over the combination of Grosselink et al., Hope et al., Anthes et al., and U.S. Patent No. 6,632,416 (hereafter referred to as Elomari). Elomari describes the use of SSZ-53 to hydrofinish a dewaxed hydrocarbon feed. However, Elomari fails to overcome the deficiencies of the other references. Elomari contains no teaching related to the production of olefins from Fischer-Tropsch derived feeds, the removal of oxygenates, or the oligomerization of higher olefins to produce base oils. It also does not provide any teaching which would lead one skilled in the art to combine the processes of Grosselink et al., Hope et al., and Anthes et al.

Applicants wish to emphasize that independent claim 23 is directed to the production of a lubricant base oil from Fischer-Tropsch wax and independent claim 26 is directed to the production of diesel from Fischer-Tropsch condensate. In addition to problems already raised with the rejections based upon Grosselink et al., Hope et al., and Anthes et al., which have been discussed in detail above, additional problems raised by the present rejection of claims 23-29 may be summarized as follows:

- The feed described by Grosselink et al. contains little or no Fischer-Tropsch wax. See for example, column 2, lines 37-39, where the reference states that 96 wt.% of the feed has a boiling point below 560°F. Fischer-Tropsch wax has a boiling point above 650°F. Therefore, the feed of Grosselink et al. has an upper boiling point at least 100°F below the initial boiling point of Applicants' feed as claimed in claim 23.
- Hope et al. has absolutely nothing to do with the production of diesel. Accordingly the relevance of Hope et al. to the patentability of claim 26 is questionable.

- In several instances the Office Action refers to a "Grosslink et al., Anthes et al., and Elomari product" implying that the three references are producing the same product. Nothing could be farther from the truth. The products described as produced using the catalyst taught by Elomari and Anthes et al. include a variety of hydrocarbons which differ in molecular weight and other properties from the lower molecular weight olefins of Grosselink et al. Neither Elomari nor Anthes et al. are concerned with the lower molecular weight olefins made by the Grosselink et al. process. It is by no means certain that any of the catalysts described by Anthes et al. or Elomari even would be useful in any of the hydroprocessing operations discussed in Grosselink et al.

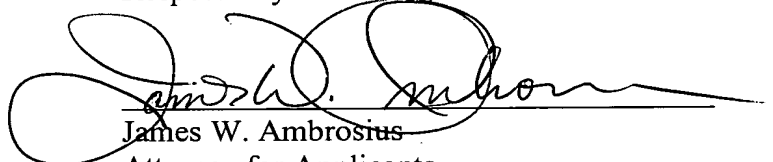
Consequently, Elomari fails to overcome the deficiencies of Grosselink et al., Hope et al., and Anthes et al. The only relevance of this reference to the present invention is that it describes one intermediate step in a series of steps claimed by Applicants. The hydrofinishing step described in Elomari is not even directed to the point of novelty within Applicants' claimed invention. Applicants view Elomari, like Anthes et al., as only of marginal relevance to the inventions covered by claims 23-29. The recent Office Action supports Applicants' argument on this point when it states that Elomari and Anthes et al. are cited only to demonstrate that hydrofinishing may be used to produce a more stable product and that the dewaxing of an oligomerized product were known in the art.

Applicants have argued that there is no basis of record which justifies the combination of Grosselink et al. and Hope et al. It has been argued that the Office Action has improperly picked from various otherwise unrelated teachings contained in the references by using Applicants' disclosure as a teaching device. It has been pointed out

that the feedstocks, process parameters, catalysts, and products of Grosselink et al. and Hope et al. are all different. However, the Office Action has failed to provide any basis for combining the two references except for the fact that certain aspects of the teachings may relate to Applicants' invention.

With the amendment of the claims in this application, it is sincerely believed that the invention is unobvious within the meaning of the statute over all of the cited art. It is respectfully submitted that all of the claims remaining in the case are directed to patentable subject matter, and allowance in due course is respectfully solicited.

Respectfully submitted,



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March 23, 2005

MARKED-UP CURRENTLY AMENDED CLAIMS

- Claim 1 (Currently Amended) A process for oligomerizing a Fischer-Tropsch derived C₅₊ feed containing oxygenates to produce a Fischer-Tropsch product comprising diesel, said process comprising ~~which comprises~~:
- (a) reducing significantly the oxygenates present in the Fischer-Tropsch derived C₅₊ feed by contacting said feed in a hydrotreating zone with a hydrotreating catalyst under hydrotreating conditions in a hydrotreating zone wherein the cracking conversion is 20 percent or less and recovering from the hydrotreating zone a Fischer-Tropsch derived hydrotreated C₅₊ feed which contains a significantly reduced amount of oxygenates as compared to the Fischer-Tropsch derived C₅₊ feed and also a significant amount of paraffins;
 - (b) pyrolyzing the Fischer-Tropsch derived hydrotreated C₅₊ feed in a thermal cracking zone under thermal cracking conditions pre-selected to crack the paraffin molecules to form olefins and collecting an olefin-enriched Fischer-Tropsch feed from the thermal cracking zone;
 - (c) contacting the olefin-enriched Fischer-Tropsch feed with a Lewis acid ionic liquid catalyst in an oligomerization zone under oligomerization reaction conditions; and
 - (d) recovering from the oligomerization zone a Fischer-Tropsch derived product comprising diesel and having molecules

characterized by a ~~higher average molecular weight and~~
increased branching as compared to the Fischer-Tropsch
derived C₅₊ feed.

- Claim 2 (Currently Amended) The process of claim 1 wherein the Fischer-Tropsch derived hydrotreated C₅₊ feed is substantially free of oxygenates.
- Claim 3 (Currently Amended) The process of claim 2 wherein the Fischer-Tropsch derived hydrotreated C₅₊ feed contains less than 200 ppmw elemental oxygen.
- Claim 4 (Currently Amended) The process of claim 3 wherein the Fischer-Tropsch derived hydrotreated C₅₊ feed contains less than 100 ppmw elemental oxygen.
- Claim 23 (Currently Amended) A process for producing Fischer-Tropsch derived lubricant base oil which comprises:
- (a) recovering from a Fischer-Tropsch plant a wax fraction;
 - (b) reducing significantly the oxygenates present in the Fischer-Tropsch wax fraction by contacting said wax fraction in a hydrotreating zone with a hydrotreating catalyst under hydrotreating conditions ~~in a hydrotreating zone wherein the cracking conversion is 20 percent or less~~ and recovering from the hydrotreating zone a hydrotreated Fischer-Tropsch derived wax feed which contains a significantly reduced amount of

oxygenates as compared to the Fischer-Tropsch derived wax fraction and also a significant amount of paraffins;

- (c) pyrolyzing the hydrotreated Fischer-Tropsch derived wax feed in a thermal cracking zone under thermal cracking conditions pre-selected to crack the paraffin molecules to form olefins and collecting an olefin-enriched Fischer-Tropsch feed from the thermal cracking zone;
- (d) contacting the olefin-enriched Fischer-Tropsch feed with a Lewis acid ionic liquid catalyst in an oligomerization zone under oligomerization reaction conditions;
- (e) recovering from the oligomerization zone a Fischer-Tropsch derived oligomerization effluent having molecules characterized by a higher average molecular weight and increased branching as compared to the Fischer-Tropsch derived feed;
- (f) catalytically dewaxing the Fischer-Tropsch derived oligomerization effluent by contacting the Fischer-Tropsch derived oligomerization effluent with a dewaxing catalyst under catalytic conditions in a dewaxing zone and collecting a dewaxed Fischer-Tropsch product from the dewaxing zone having improved cold flow properties relative to the Fischer-Tropsch derived oligomerization effluent;

- (g) hydrofinishing the dewaxed Fischer-Tropsch product in a hydrofinishing zone under hydrofinishing conditions in the presence of a hydrofinishing catalyst; and
- (h) collecting a Fischer-Tropsch derived lubricant base oil from the hydrofinishing zone.

Claim 26 (Currently Amended) A process for producing Fischer-Tropsch derived lubricant base oil which comprises:

- (a) recovering from a Fischer-Tropsch plant a condensate fraction;
- (b) removing substantially all of the oxygenates present in the Fischer-Tropsch condensate fraction by contacting said condensate fraction in a hydrotreating zone with a hydrotreating catalyst under hydrotreating conditions ~~in a hydrotreating zone~~ wherein the cracking conversion is 20 percent or less and recovering from the hydrotreating zone a substantially oxygenate-free Fischer-Tropsch derived condensate feed which also contains a significant amount of paraffins;
- (c) pyrolyzing the substantially oxygenate-free Fischer-Tropsch derived condensate feed in a thermal cracking zone under thermal cracking conditions pre-selected to crack the paraffin molecules to form olefins and collecting an olefin-enriched Fischer-Tropsch feed from the thermal cracking zone;

- (d) contacting the olefin-enriched Fischer-Tropsch feed with a Lewis acid ionic liquid catalyst in an oligomerization zone under oligomerization reaction conditions;
- (e) recovering from the oligomerization zone a Fischer-Tropsch derived oligomerization effluent having molecules characterized by a higher average molecular weight and increased branching as compared to the Fischer-Tropsch derived feed;
- (f) catalytically dewaxing the Fischer-Tropsch derived oligomerization effluent by contacting the Fischer-Tropsch derived oligomerization effluent with a dewaxing catalyst under catalytic conditions in a dewaxing zone and collecting a dewaxed Fischer-Tropsch product from the dewaxing zone having improved cold flow properties relative to the Fischer-Tropsch derived oligomerization effluent;
- (g) hydrofinishing the dewaxed Fischer-Tropsch product in a hydrofinishing zone under hydrofinishing conditions in the presence of a hydrofinishing catalyst; and
- (h) collecting a Fischer-Tropsch derived lubricant base oil from the hydrofinishing zone.